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Thermal and Sensitivity Analysis of MHD Elastico-viscous Hybrid Nanofluid between Two Rotating Disks

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The heat and mass transfer of nanoparticle suspensions between rotating disks has gained significant research interest due to its wide industrial applications. This study investigates the thermal behaviour of magnetohydrodynamic (MHD) ethylene glycol-based elastico-viscous hybrid nanofluids, incorporating nonlinear radiation and heat source effects. The governing equations, derived from conservation laws, are transformed into a non-dimensional form and solved using the spectral local linearization method (SLLM). The method's accuracy and its convergence are established. Graphical and tabular representation of the fluid profiles demonstrates how key parameters influence fluid behaviour. Results show that increasing the thermal radiation parameter, Eckert number, heat source, and nonlinear radiation effects augment the fluid temperature. Magnetic field and elastico-viscous fluid parameters reduce tangential and axial velocities but enhance temperature distribution. Sensitivity analysis highlights the influence of each parameter near the disk walls, with the Reynolds number having the most significant effect on radial drag force. Additionally, viscous dissipation, magnetic field strength, and temperature-dependent heat sources notably affect heat transfer rates. These findings offer valuable insights for optimising systems such as processing plants, heat exchangers, and nuclear reactors.

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